Rotating module – vertical axis DMV 600

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1 Description

1.1 General description

The rotating module - horizontal axis DMV is a plain bearing rotation axis that can compensate high axial and radial forces. The angle of rotation in both directions is 360°.

Due to special bearings it is insensitive to shocks and thrusts.

The design of the rotating module allows its integration in applications with light as well as with heavy loads.

When using the rotating module in assembly processes, workpieces can be rotated rationally, quickly and safely and can be assembled ergonomically from all sides.

The rotating module is – except in its basic version

– equipped with an indexing.

Indexing is the procedure to proceed to the next working process.

The indexing angle is 8 x 45°, 6 x 60°, 4 x 90°, 3 x 120°.

1.2 Version with indexing by foot pedal

The rotating module with hydraulic indexing is a compact and functional unit.

It consists of a basic module with integrated indexing mechanism and an operating unit with foot pedal, connected by a 2 m long hydraulic hose.

This flexible connection allows the individual placement of the operating unit at the most favourable ergonomic position.

The rotating operation is manually effected at the workpiece or at the assembly fixture.

2 Validity of the documentation

This document applies to the following products:

Rotating modules - horizontal axis of data sheet M 3.101. The following types or part numbers are concerned:

- Version without indexing 6506-10-36-O
- Indexing with foot pedal 6509-10-45-O-I, 6509-10-60-O-I, 6509-10-36-O-I, 6509-10-12-O-I.

3 Target group of this document

- Specialists, fitters and set-up men of machines and installations with hydro-mechanical expert knowledge.

Qualification of the personnel

Expert knowledge means that the personnel must

- be in the position to read and completely understand technical specifications such as circuit diagrams and product-specific drawing documents,
- have expert knowledge of function and design of the corresponding components.

A specialist is somebody who has due to its professional education and experiences sufficient knowledge and is familiar with the relevant regulations so that he

- can judge the entrusted works,
- can recognize the possible dangers,

- can take the required measures to eliminate dangers,
- knows the acknowledged standards, rules and guidelines of the technology.
- has the required knowledge for repair and mounting.

4 Symbols and signal words

⚠ DANGER

Danger of life / heavy health damages

Stands for an imminent danger.

If it is not avoided, death or very severe injuries will result.

⚠ WARNING

Person damage

Stands for a possibly dangerous situation.

If it is not avoided, death or very severe injuries will result.

⚠ CAUTION

Easy injuries / property damage

Stands for a possibly dangerous situation.

If it is not avoided, minor injuries or material damages will result.

Hazardous to the environment

The symbol stands for important information for the proper handling with materials that are hazardous to the environment.
Ignoring these notes can lead to heavy damages to the environment.

Mandatory sign!

The symbol stands for important information, necessary protection equipment, etc.

▶ **Note**

This symbol stands for tips for users or especially useful information. This is no signal word for a dangerous or harmful situation.

5 Safety instructions

5.1 Basic information

The operating instructions serve for information and avoidance of dangers when installing the products into the machine as well as information and references for transport, storage and maintenance.

Only in strict compliance with these operating instructions, accidents and property damages can be avoided as well as trouble-free operation of the products can be guaranteed.

Furthermore, the consideration of the operating instructions will result in:

- reduced down times and repair costs,
- increased service life of the products.

▶ **Note**

These operating instructions are not a replacement for the operating instructions of the entire machine.

5.2 General safety tips

⚠ WARNING

Injuries due to misuse, incorrect operation or abuse!

Injuries can occur if the product is not used within the intended use and the technical performance data.

Before start up, read the operating instructions!

⚠ WARNING

Poisoning due to contact with hydraulic oil!

Wear, damage of the seals, ageing and incorrect mounting of the seal kit by the operator can lead to escapes of oil.

Incorrect connection can lead to escapes of oil at the ports.

For handling with hydraulic oil consider the material safety data sheet.

Wear protection equipment.

⚠ WARNING

Injury by crushing!

Components of the product make a movement while they are in operation.

This can cause injuries.

Keep parts of the body and items out of the working area!

⚠ CAUTION

Damage of components!

Side loads and forced conditions on the product lead to the premature failure.

Avoid forced conditions (overdetermination) of the product.

Max. forces and torques see technical characteristics.

⚠ CAUTION

Damage of components!

The admissible performance data of the product, see chapter "Technical characteristics", may not be exceeded.

▶ **Note - qualification of the user**

All works may only be effected by qualified personnel familiar with the handling of hydraulic components.

5.3 Personal protective equipment

For works at and with the product, wear safety goggles!

For works at and with the product, wear protective gloves!

For works at and with the product, wear safety shoes!

6 Application

6.1 Intended use

Rotating modules are designed for universal use in assembly and handling processes in the industry.

They are used for industrial applications in order to rotate workpieces rationally, quickly and safely.

Furthermore the following are possible uses:

- Max. forces and / or torques only with the values indicated below technical characteristics.
- Max. torques at the hand lever only with the values indicated below technical characteristics.
- Use only within closed, low-dust rooms
- Use within the capacity indicated in the technical characteristics (see data sheet).
- Use as per operating instructions.
- Compliance with service intervals.
- Qualified and trained personnel for the corresponding activities.
- Mounting of spare parts only with the same specifications as the original part.

6.2 Misapplication

⚠ WARNING

Injuries, material damages or malfunctions!

The product must never be opened. At the product no changes must be made, except the ones expressly mentioned in the operating instructions!

The use of these products is not admitted:

- For domestic use.
- On pallets or machine tool tables in primary shaping and metal forming machine tools.
- If due to vibrations or other physical / chemical effects damages of the products or seals can be caused.
- On pallets or machine tool tables that are used to change the characteristics of the material (magnetise, radiation, photochemical procedures, etc.).
- In areas for which special guidelines apply, especially installations and machines:
  - For the use on fun fairs and in leisure parks.
  - In food processing or special hygiene regulations.
  - For military purposes.
  - In mines.
  - In explosive and aggressive environments (e.g. ATEX).
  - In medical engineering.
  - In the aerospace industry.
  - For passenger transport.

7 Installation

7.1 Design

⚠ WARNING

Injury by falling parts!

Keep hands and other parts of the body out of the working area.

Wear personal protection equipment!

⚠ CAUTION

Damage of components!

Some product types have a considerable weight. These have to be secured against working free during transport.

Weight specifications see chapter "Technical characteristics".

⚠ CAUTION

Damage of components!

Side loads and forced conditions on the product lead to the premature failure.

Avoid forced conditions (overdetermination) of the product.

Max. forces and torques see technical characteristics.

⚠ CAUTION

Damage of components!

The maximum operating torque at the operating shaft must not be exceeded.

This can be achieved e.g. by limiting the operating stroke of the customer's operating element (hand lever or pedal) by the floor.

7.2 Version without indexing

The rotating module does not have an indexing in its basic version.

The rotating operation is effected manually at the workpiece or at the assembly fixture.

7.3 Version with hydraulic indexing

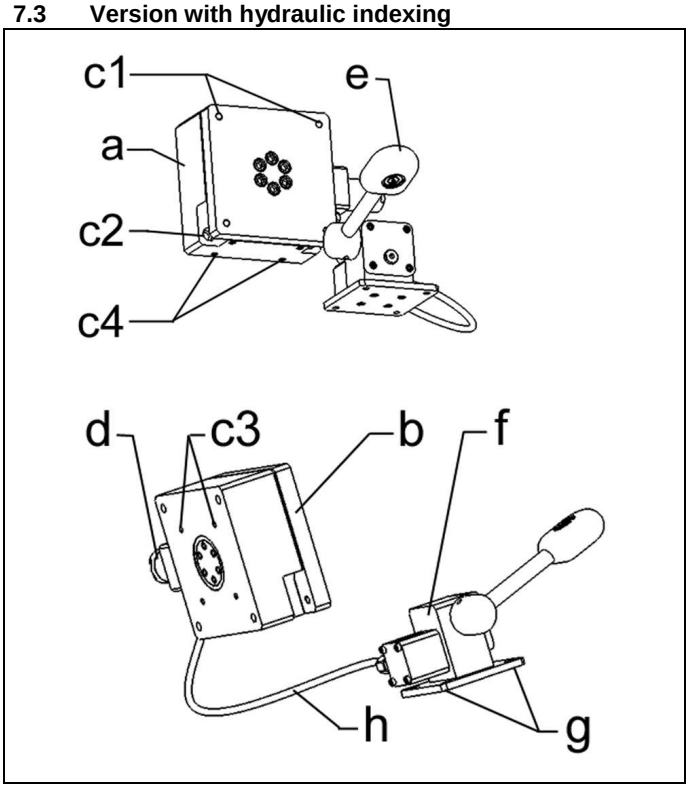

Figure 1: Components

⚠ CAUTION

Damage of components!

Foot pedal is pressed down below the lower edge of the base plate.

The customer has to make sure that this will be prevented by the concrete floor or a corresponding base plate connecting construction.

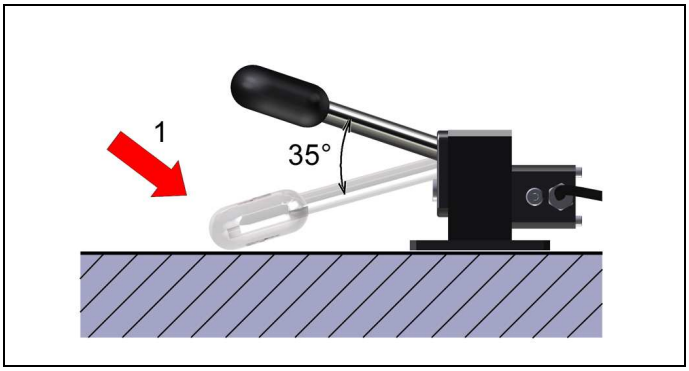

Figure 2: External stop

a Basic unit	d Hydraulic indexing (receiver unit)
b Flange plate	e Foot pedal
c1 Threads 4 x M10 to fix further components	f Pressure generator (transmitter unit)
c2 Counterbores for 4 x M10 to fix the rotary module at the fixture	g Bore holes 4 x M8 to fix the pressure generator
c1 Threads 4 x M10 to fix the index. Not suitable to fix add-ons.	1 External stop
c4 Threads 4 x M10 to fix the rotating module vertically on the fixture	

Note

Pressure generators, hoses and hydraulic indexing must not be opened.

Penetrating air can lead to malfunction.

7.4 Fixing of the product

⚠ WARNING

Injury due to overturning product!

Overturning product due to missing or incorrect fixing!

Fasten bottom plate on the floor.

When introducing torques within the load limit (see technical characteristics) we recommend to use an additional base plate (accessory) and to secure this plate correctly.

⚠ CAUTION

Damage of components!

Foot pedal is pressed down below the lower edge of the base plate.

The customer has to make sure that this will be prevented by the concrete floor or a corresponding base plate connecting construction.

1. Install the product so that for the required cleaning and maintenance works there is all around a clearance zone of at least 700 mm.
2. The product has to be mounted horizontally on a plane and solid concrete floor (concrete strength grade B 25) or a rigid connecting construction of the customer (flatness 0.20 mm).
3. Fasten the bottom plate of the product with hexagon socket head cap screws ISO 4762 - M10 onto the concrete floor or the connecting construction of the customer.
4. For this purpose professionally insert into the concrete floor heavy-duty dowels (e.g. Fischer part-no.: SL M-10 N).

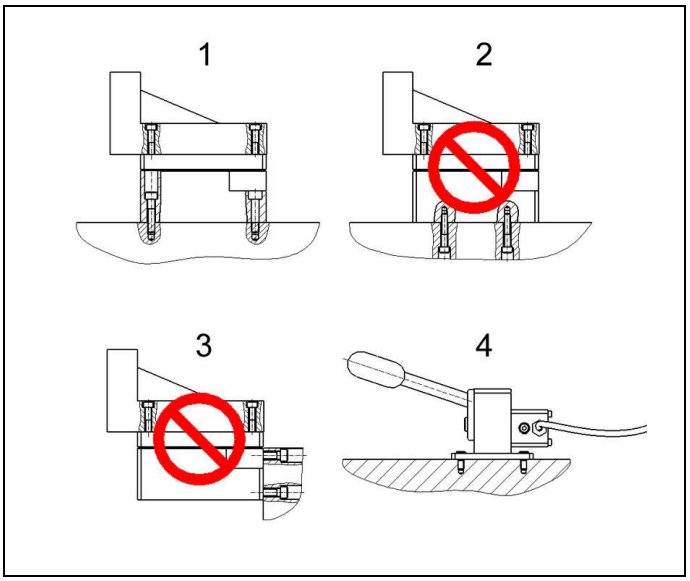

Figure 3: Possible principles of fixation

1	Wall mounting screwed through rotary module Angle bracket provided by the customer at the flange plate	3	Not admissible!
2	Not admissible!	4	of pressure generator (transmitter unit)

Note

To reach the third indexing position a swing angle of ~230° is required.

Note

The mounting types depend on the design of the rotating module.

7.5 Mounting of the customer's connecting construction

⚠ WARNING

Injury due to overturning product!

Overturning product due to eccentric load provided by the user!

The centre of gravity of the user's load must be within the 4 fixing screws of the bottom plate.

When introducing torques within the load limit (see technical characteristics) we recommend to use an additional base plate (accessory) and to secure this plate correctly.

1. For fixing of the customer's connecting construction there are 4 bore holes (for M10 - ∅ 10.5 mm) at the top plate.
   All provided bore holes have to be used!
2. Fasten the connecting construction at the top plate.

Note

Dangers due to the connecting construction of the customer, as e.g. squeezing points have to be excluded by the customer's design.

In the case of eccentric loads, it is recommended to compensate these by counterweights. This prevents unregulated swinging of the load (changing - swivelling).

In off-position the indicated maximum torques may occur (see Technical characteristics).

The required forces and torques, around the axis of rotation, have to be considered by the operator. During the rotating motion only 50% of the maximum values are admitted.

8 Start up

⚠ WARNING

Injury by crushing!

Components of the product make a movement while they are in operation.

This can cause injuries.

Keep parts of the body and items out of the working area!

⚠ WARNING

Injury by crushing!

Due to protruding components there can be pinch points during installation.

Keep hands and fingers away from pinch points!

⚠ WARNING

Injury / burning due to contact with energized parts!

Before working on electric equipment, the energized parts must be de-energized and secured.

Do not open protection covers at electric parts.

All electrical works must only be realised by electricians.

8.1 Preparation for start up

Before start up the following tests have to be made:

- Check if there are any transport damages at the rotating module
- Check tight seating of the plug.
- The cables must be fixed by the user so that no bending and tensile stress will act and the cables cannot be damaged in any way.
- The rotating module was developed and built according to the applicable EMC standards EN 61000-6-2 and EN 61000-6-4.
  It has to be checked whether there are faults in or interactions between the components used.

8.2 Connection of power supply

The power supply is made via an external switching power supply (see accessory).

Alternatively a 24 VDC switching power supply, 20 A, can be used that must be designed with short circuit protection.

- Connect the connecting cable to the power supply.
  Connection:
  1 = + 24 V
  2 = 0 V (GND),
  numbered

8.3 Connect manual switch or foot switch

- Connect the manual switch or foot switch to the bushing of the rotating module and fix it with the enclosed screw. Tightening torque max. 0.4 Nm.

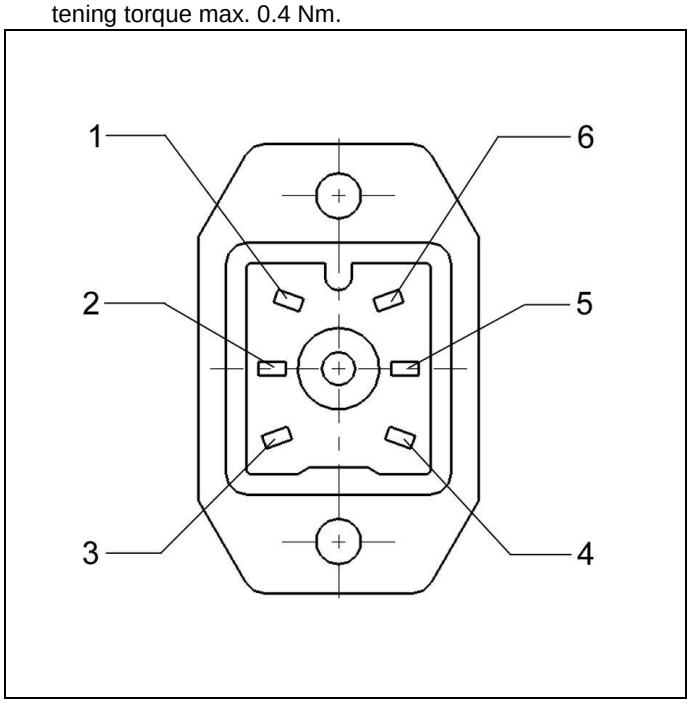

Figure 4: Connection of the ports

1	+24V output (for manual switch)	4	input at the left side
2	GND	5	output position reached +24V
3	input at the right side	6	error

8.4 Switch on power supply

To set up the rotating drive and the control, switch on the power supply.

8.5 Move to the off-position - zero position

Push a directional key (⇑) or. (⇓) of the manual switch or foot switch (see accessory). Turn the flange plate (with mounted parts) to the desired off-position - zero position.

8.6 Save the off-position - zero position

To save the off-position, push both directional keys of the manual switch or foot switch for three seconds. The current position will be saved as off-position - zero position.

8.7 Interface for higher-level control

Reaching of the position "position reached **(5)**" can be evaluated by the higher-level control.

8.8 Adjustment of the speed of rotation

⚠ WARNING

Injuries due to rotating movement of the flange plate and their mounting parts!

Adjust the speed as per the developed safety concept, general guidelines and standards or provide safety devices, if required!

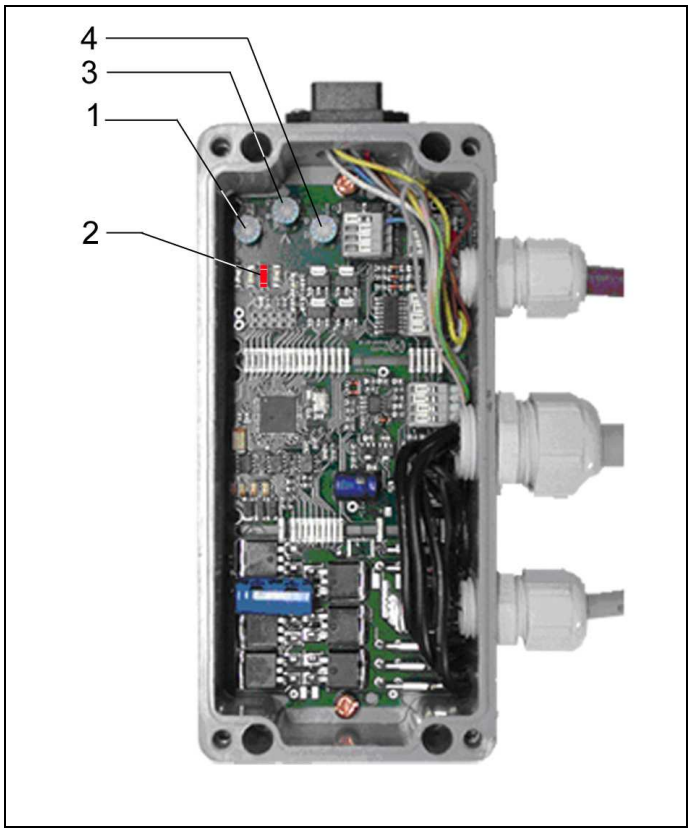

Figure 5: Position of the elements on the board

1	Trimming potentiometer to adjust the indexing angle	3	Trimming potentiometer to adjust the speed of rotation
2	LED for the display of malfunctions	4	Trimming potentiometer to adjust the braking curve

The speed of rotation can be adjusted by a trimming potentiometer on the control board.

For this purpose, open the cover of the control.

Carefully operate the trimming potentiometer with the screwdriver until the desired speed of rotation is obtained.

Close the cover again.

8.9 Adjust the indexing angle

The indexing angle is factory set to an angle of 90°. This means that the rotating module stops automatically when reaching one of the 90° positions.

However, this can be adapted afterwards to the desired requirements.

The indexing angle can be changed step by step by means of the trimming potentiometer with the marking E on the control board.

- Pos. 0 - indexing angle 90° (factory setting)
- Pos. 3 - indexing angle 45°
- Pos. 7 - indexing angle 60°
- Pos. 10 - indexing angle 180°

Screw on the cover.

9 Operation

⚠ WARNING

Injury by crushing!

Loads (torques) can lead to an unexpected start of the product.

When releasing the index, counter hold the existing load.

Pay attention to an ergonomic working place and max. physical forces.

⚠ WARNING

Injury by crushing!

Components of the product make a movement while they are in operation.

This can cause injuries.

Keep parts of the body and items out of the working area!

⚠ CAUTION

Damage of the indexing!

If the indexing bolt engages in full motion, the indexing will be dynamically overloaded.

The module must only be moved to the engaging position in a controlled manner (counterhold).

9.1 Version without indexing

The rotating module does not have an indexing in its basic version.

The rotating operation is effected manually at the workpiece or at the assembly fixture.

9.2 Hydraulic indexing

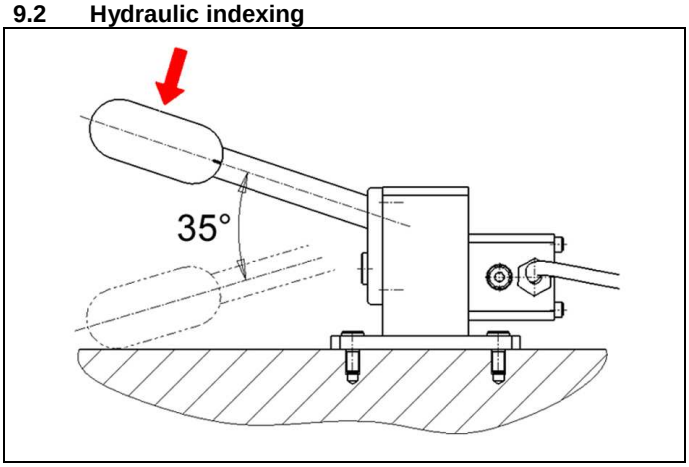

Figure 6: Operation - Indexing operated by a foot pedal

By operating the foot pedal by 35° the index is released and the workpiece or the fixture can be rotated.

If the foot pedal is not operated, the index bolt engages automatically into the next indexing position.

The operation with a foot pedal guarantees that the operator always has both hands free.

10 Maintenance

10.1 Plan for maintenance

Maintenance works	Interval	by...
Cleaning, visual check of the rotating module and control of the indexing	daily	Operator
Check all fixing screws, retighten if required. Control of the indexing	half-yearly checks	Expert
Check smooth running with little load over the entire rotating range	yearly	Expert
Check smooth running with load over the entire rotating range	yearly	Expert
Revision by the manufacturer (recommendation)	After 50,000 cycles	ROEMHELD service staff
Repair	in case of damages	ROEMHELD service staff

▶ **Note**

Pay attention to the qualification of the personnel.

10.2 Cleaning

The following cleaning works have to be effected daily at the mechanical components.

1. Clean with cleaning clothes or cleaning rags.
2. Slightly lubricate the metallic components (plates, guides, etc.).

10.3 Monthly checks

- Visual inspection.
- Check the unit for damages and possible running marks, repair if required.
- Check the axial and radial clearance, repair if required.
- Check the indexing for smooth running and clearance

▶ **Note**

Repair works, as e.g. the change of the interior lifting jack may only be effected by the ROEMHELD service technicians.

10.4 Yearly checks

Hydraulic system, hydraulic hoses

An expert has to check all hydraulic components at least once a year if they are still work-proof. Assessed damages have to be repaired immediately.

The following checks and works have to be effected:

- An expert has to check all hydraulic hoses at least once a year if they are still work-proof. Assessed damages have to be repaired immediately.
- The hydraulic hoses of the device have to be exchanged as per BGR 237 at least after 6 years by new ones.

10.5 Repair

Note

Repair works, as e.g. the change of the interior lifting jack may only be effected by the ROEMHELD service technicians.

10.6 Maintenance of the hydraulic indexing

The rotating module with hydraulic indexing is a compact and functional unit.

It consists of a basic module with integrated indexing mechanism and an operating unit with foot pedal, connected by a 2 m long hydraulic hose.

This flexible connection allows the individual placement of the operating unit at the most favourable ergonomic position.

The rotating operation is manually effected at the workpiece or at the assembly fixture.

The design of the indexing is a closed system.

When opening the system, the preloaded effect will get lost.

To guarantee a system free from air, the transmitter unit, the high-pressure hose and the receiver unit must be flushed.

Procedure:

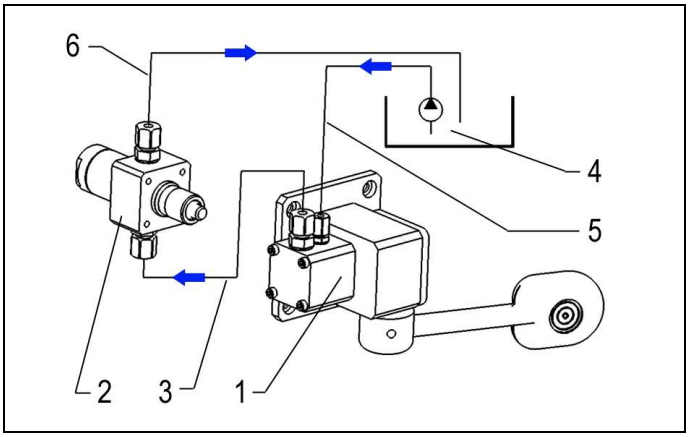

Figure 7: Sketch how to vent the indexing

➡	Direction of flushing	4	Pressure generator for flushing, with return line to the reservoir
1	Transmitter unit	5	Flushing line
2	Receiver unit	6	Reservoir line
3	High-pressure hose 2 m		

1. Connection of hose lines (see fig. of the sketch).

Note

The ports have to be aligned towards the top.

2. Connect to a pressure generator (preferably to a small power unit).
3. Flush the system several minutes.

   Actuate the pedal several times to loosen trapped air bubbles.

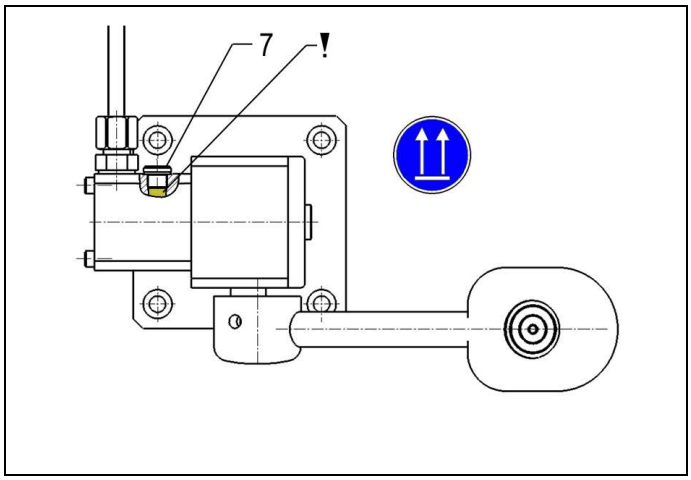

Figure 8: Alignment for bubble free mounting of the fittings

!	Pay attention to the oil level	7	Plug

4. Align the transmitter unit as shown and remove the flushing line.

Note

Align the transmitter unit as shown in the figure.

Oil must be in the connecting port up to the upper edge of the connecting thread.

Refill oil, if required.

Put the plug slightly tilted onto the surface of the oil and screw in.

5. Vent the receiver unit

⚠ CAUTION

Injury due to the spring in the subassembly!

The component can slip and the the piston extends.

Provide a holding device!

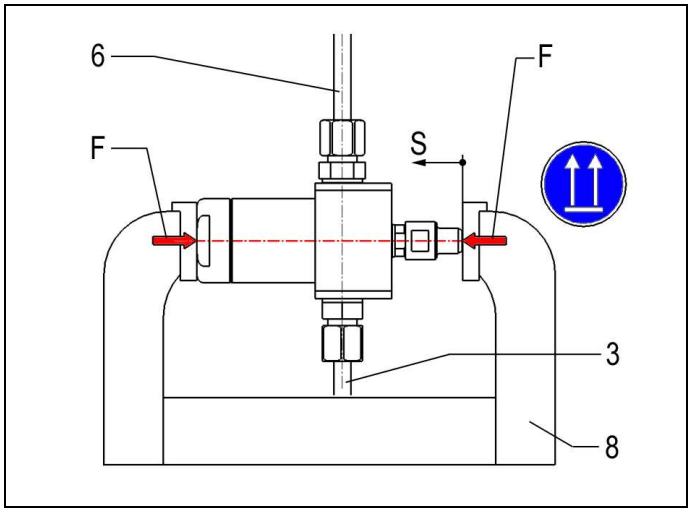

Figure 9: Alignment for bubble free mounting of the fittings

3	High-pressure hose 2 m	F	Force required
6	Reservoir line	S	Stroke approx. 13.5 mm
8	Vice or clamp		

Receiver unit in shown alignment, in the vice, preload and remove reservoir line.

Note

Align the receiver unit as shown in the figure.

Oil must be in the connecting port up to the upper edge of the connecting thread.

Refill oil, if required.

Put the plug slightly tilted onto the surface of the oil and screw in.

6. Loosen the preload of the receiver unit.
7. Check function.

11 Trouble shooting

⚠ CAUTION

Damage of components!

All works only to be effected by ROEMHELD service staff.

All rotating modules

Trouble	Cause	Remedy
Indexing does not engage	Too fast rotation	Decelerate rotation
	Max. admissible torques exceeded Indexing defect	⚠ **Caution !** Works only to be effected by ROEMHELD service personnel.
Top plate lowers without operation of the foot pedal	Internal lifting jack defect	Replace the lifting jack by ROEMHELD service personnel
Clearance in the indexing too large	Wear or max. admissible torques exceeded	⚠ **Caution !** Works only to be effected by ROEMHELD service personnel.

Only for indexing with foot pedal

Trouble	Cause	Remedy
Indexing does not disengage	Air in the hydraulic system Components were opened	⚠ **Caution !** Works only to be effected by ROEMHELD service personnel.

12 Technical characteristics

Maximum admissible load

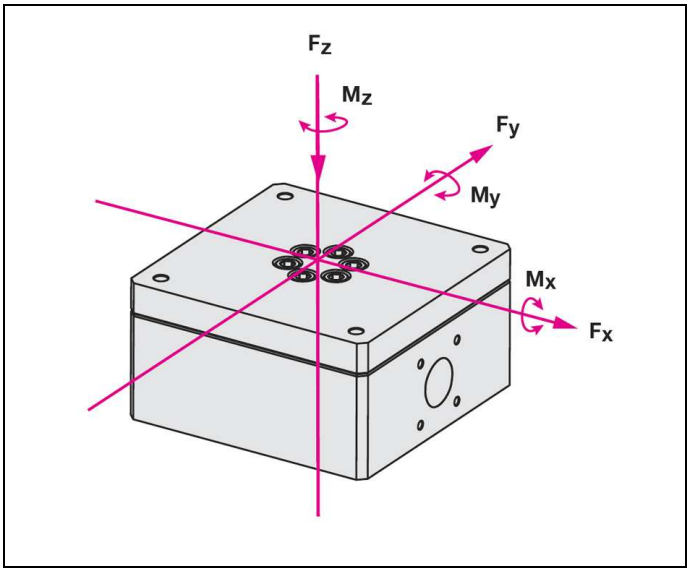

Figure 10: Axes of the introduced forces and torques

M Max. torques in the axes: X, Y or Z	F Max. admissible forces in the axes: X, Y or Z

Max. admissible forces, for all versions

Fx = ± 2,000 N
Fy = ± 2,000 N
Fz = ± 6,000 N.

Max. admissible torques

Note

These torques are valid for all versions with indexing in engaged mode.

In the case of eccentric loads, it is recommended to compensate these by counterweights. In off-position the indicated maximum torques may occur.

General characteristics

Type		Mz [Nm]
6506 10 36 O	Without indexing	not relevant
6509 10 XX O I	Indexing with foot pedal	800

Weight (dead weight)

Type		m [kg]
6506 10 36 O	Without indexing	15
6509 10 XX O I	Indexing with foot pedal	25

Note

For further technical data see data sheet.

⚠ CAUTION

Damage of the indexing!

If the indexing bolt engages in full motion, the indexing will be dynamically overloaded.

The module must only be moved to the engaging position in a controlled manner (counterhold).

13 Accessory

Note

See data sheet.

14 Disposal

Hazardous to the environment

Due to possible environmental pollution, the individual components must be disposed only by an authorised expert company.

The individual materials have to be disposed as per the existing regulations and directives as well as the environmental conditions.

Special attention has to be drawn to the disposal of components with residual portions of hydraulic fluids. The instructions for the disposal at the material safety data sheet have to be considered.

For the disposal of electrical and electronic components (e.g. stroke measuring systems, proximity switches, etc.) country-specific legal regulations and specifications have to be kept.

15 EC-Declaration of conformity

Manufacturer

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Rotating modules - horizontal axis of data sheet M 3.101. The following types or part numbers are concerned:

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- Indexing with foot pedal 6509-10-45-O-I, 6509-10-60-O-I, 6509-10-36-O-I, 6509-10-12-O-I.

16 List of the applied standards

2001/95/EC, General product safety

92/58/EEC, Minimum requirements for the provision of safety and/or health signs at work

89/391/EEC, Introduction of measures to encourage improvements in the safety and health of workers at work

89/655/EEC, Minimum safety and health requirements for the use by workers of personal protective equipment at the workplace

Operating safety regulations (BetrSichV) for the transposal of the directive on the introduction of measures to encourage improvements in the safety and health of workers at work. (German implementation of the Work Equipment Directive 89/655/EEC)

Product Safety Act - PSG; November 2011

DIN EN ISO 12100, 2011-03, Safety of machinery; Basic concepts, General principles for design (replacement for part 1 and 2)

DIN EN ISO 13857; 2008-06, Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs. (replaces: DIN EN 294)

DIN EN 349, 2008-09, Safety of machinery. Minimum gaps to avoid crushing of parts of the human body

DIN EN 614-1 a. 2, 2009-06, Safety of machinery - Ergonomic design principles

DIN EN 1494; 2009-05, Mobile or movable jacks and associated lifting equipment

DIN EN 626-1, 2008-09, Safety of machinery - Reduction of risks to health from hazardous substances emitted by machinery

DIN EN ISO 4413, 2011-04, Hydraulic fluid power - General rules and safety requirements for systems and their components

DIN EN 1037, 2008-11, safety of machinery - prevention of unexpected start-up.

DIN EN 81714-2, 2007-08, Design of graphical symbols for use in the technical documentation of products

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Laubach, 06.12.2012